REMARKS

The official action of 11 July 2008 has been carefully considered and reconsideration of the application as amended is respectfully requested.

Claim 1 has been amended with the incorporation of the recitations formerly in claim 13 (now canceled), to recite an activation temperature in the range of 600-700°C in accordance with the description in the specification as filed at, for example, page 3, lines 28-31 and to recite that the activated carbon has a uniform pore size in accordance with the description in the specification as filed at, for example, page 3, lines 28-29. The claim has also been amended to recite that the claimed activation is carried out without steam. Support for this recitation appears in the specification as filed at, for example, page 2, last line to page 3, line 5 (drawbacks of steam activation) and page 3, lines 21-24 (obviation of these drawbacks). See, also, MPEP 2173.05(i) ("If alternative elements are positively recited in the specification, they may be explicitly excluded in the claims.").

Claims 14-21 have been added more completely to define the subject matter which Applicants regard as their invention. These claims track the recitations in claims 1-7 and 9, but recite the "consisting essentially of" transitional to preclude the use of steam activation and also to preclude process steps that would result in formation of potassium compounds that are unstable in an atmosphere of CO_2, O_2 and H_2O (see specification at page 2, lines 12-15).

The specification at page 2, lines 12-15 and page 2, last line to page 3, line 5 makes clear that these steps would materially adversely affect the basic and novel characteristics of the claimed invention such that such steps are precluded by the "consisting essentially of" transitional of these claims. See MPEP 211.03.

Claims 1-3, 5, and 8-10 stand rejected under 35 USC 103(a) as allegedly being unpatentable over MacDowall. Claims 1, 5-10, 12 and 13 stand rejected under 35 USC 103(a) as allegedly being unpatentable over Otowa. Claims 1-13 stand rejected under 35 USC 103(a) as allegedly being unpatentable over Derbyshire. Applicants respectfully traverse these rejections.

The claimed invention provides an improved process for the preparation of high surface area activated carbon from coconut shell that is useful for fabricating fuel cell and ultracapacitor electrodes with enhanced performance. A simple route has been devised to activate the coconut shell carbon using a chemical activating agent, such as zinc chloride or potassium hydroxide, sequentially with a carrier gas, such as N_2 or CO_2, at a temperature ranging from 600-700°C. This requires pre-treatment steps that include heating of the coconut shells within two (2) separate temperature ranges: a first range for drying the shells, a second range for carbonizing coconut shell powder, in addition to a third range for activating the carbon powder.

With the improved process of the claimed invention, an activated carbon with **uniform** pore size and having the claimed BET surface area is obtained

without steam and at lower activation temperature (**600-700°C**) than was possible with the prior art processes (see discussion in Background section of the present specification at page 2, line 7 to page 3, line 19). The activated carbon prepared with the claimed process is active and particularly useful in the fabrication of fuel cell and ultracapacitor electrodes.

As next discussed, none of the cited references shows or suggests the recited features of the claimed invention, including the claimed three-stage heating steps, or the criticality thereof in forming from coconut shells an activated carbon having the claimed characteristics without the use of high temperature in the activation stage.

MacDowall

First, Applicants respectfully note that this reference has not been applied against the recitations in claim 13 which have now been incorporated into claim 1 such that the reference is overcome for this reason alone.

MacDowall describes a method of producing activated carbon using a phosphoric acid activation process. The starting material is a young carbonaceous vegetable product which is ground into particles of a mean particle size of between 30mum and 60mum [Column 3, lines 43-45].

The examiner notes that the reference teaches grinding coconut shells to 40 microns (400 mesh is 37 microns), but this is irrelevant to the invention

defined by the claims as amended which require that the activated carbon formed by the process have a uniform pore size. In the reference, the ground particles are pelletized which would necessarily result in non-uniformity. The step of pelletizing starting material is necessary in MacDowall which critically affects the pore size distribution and accessibility to pores. Pelletizing also implies many changes in the physical state of the material with altered morphology and reactivity. MacDowall's activated carbon would have non-uniform micropores.

Moreover, MacDowall does not show or suggest the claimed three separate stages of drying, carbonizing and activation in the claimed temperature ranges or that the process results in an activated carbon with a very high surface area as claimed characterized by a nitrogen adsorption isotherm at 77 K, a BET surface area in the range of 1500-2000m2/g with average pore diameter 17-21 Å layer and a capacitance in the range of 10-180 F/g.

Otowa

Otowa discloses a method of producing activated carbon with a large surface area and a low sulfur content, which starts with coconut shell char as a carbonaceous material and potassium hydroxide hydrate with a water content of 2 to 25 weight percent as an activator.

Otowa teaches treating coconut shell char with potassium hydroxide hydrate with a water content of 2 to 25 weight percent as an activator [Column 2,

line 13-15]. Potassium hydroxide hydrate with a water content of 2 to 25 weight percent is melted at a temperature of about 200 to 250°C, to give a thoroughly clear colorless liquid to contact with coconut shell char. A drawback with the use of potassium hydroxide hydrate as an activator is, if the water content is less than 2 weight percent, the high melting temperature required detracts from workability, while potassium hydroxide hydrate with a water content over 25 weight % is inadequate in activating. So a major drawback in the Otowa process is the water content which requires expertise to handle the equipment in order to control the overall water content of the reaction. If the water content increases over 25 weight %, then potassium hydroxide hydrate would work inadequately as an activator.

The claims require drying the coconut powder **after** treating with the activating agent and thus preclude the use of potassium hydroxide hydrate in the activating step, and the claimed invention is patentably distinguishable from the reference for this reason alone. In addition, Otowa teaches heat-treating the coconut shell char and potassium hydroxide hydrate at not lower than 480°C (column 2, lines 46-48) and thus teaches away from the claimed carbonizing step at a temperature within the second range.

Moreover, Otowa does not teach or suggest the claimed pretreatment steps or three stage heating, as acknowledged by the Examiner. The Examiner's naked and unsupported statements that "the heating regimes taught are similar to the temperatures claimed" and "doing so (pretreatment) is an obvious

expedient to avoid impurities and contamination" are respectfully inadequate to set forth even a *prima facie* case of obviousness in the absence of documentary support. See MPEP 2144.03 ("It would not be appropriate for the examiner to take official notice of facts without citing a prior art reference where the facts asserted to be well known are not capable of instant and unquestionable demonstration as being well-known."). Applicants respectfully request evidentiary support if the Examiner persists in the rejection.

Finally, with respect to claims 14-22, another drawback of Otowa is the formation of potassium compounds that are unstable in an atmosphere of CO_2, O_2 and H_2O moisture, which induces changes in microstructure changes in surface functional groups during storage and high resistance due to carbonate formation. The "consisting essentially of" transitional precludes the Lee process steps that result in these drawbacks (see discussion above).

Derbyshire

In Derbyshire et al, activation is done at 800-900°C in steam atmosphere and the claims as amended, which preclude such steam treatment, are patentably distinguished from the reference for this reason alone. The use of steam at such a high temperature makes it difficult to regulate the process due to uncontrolled kinetics. This drawback is overcome by the claimed process with the use of a low activation temperature in, e.g., a N_2/CO_2 atmosphere.

Moreover, Derbyshire et al do not teach the claimed pretreatment of coconut shells or the claimed heating at three different temperatures as claimed. The Examiner's contention that it would have been obvious for a person skilled in the art to optimize the process parameters to arrive at the claimed invention is respectfully not correct since the reference itself states that the properties of the activated carbons are influenced by the processing route and conditions. See Derbyshire at column 2, lines 13-15. (Note: the statement that the precursor structure is the most determinant factor does not negate the teaching that the properties are influenced to some extent by the processing route and conditions.)

Moreover, the optimization of parameters in the reference process would be directed toward the preparation of activated carbon for a different use (the purification of liquids and gases) than the activated carbon of the claimed process such that an optimization of the activated carbon of the reference would not have the claimed BET surface or other characteristics. (Note: This argument is based on the claim recitations incorporated from claim 13 into claim 1, not on a method of use.)

In view of the above, Applicants respectfully submit that all of the prior art and other rejections and objections of record have been overcome and that the application is now in allowable form. An early notice of allowance is earnestly solicited and is believed to be fully warranted.

Respectfully submitted,

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